Advisory Action Before the Filing of an Appeal Brief	**Application No.** 08/471,890	**Applicant(s)** HUFFMAN ET AL.	
	Examiner Dah-Wei Yuan	**Art Unit** 1795	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 23 September 2010 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:
   a) ☒ The period for reply expires *3* months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

   Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   (a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
   (b) ☒ They raise the issue of new matter (see NOTE below);
   (c) ☒ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   (d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: *See Continuation Sheet*. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☒ Applicant's reply has overcome the following rejection(s): See Continuation Sheet.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): a) ☒ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
   The status of the claim(s) is (or will be) as follows:
   Claim(s) allowed: *122-124,126,130 and 131*.
   Claim(s) objected to: *125*.
   Claim(s) rejected: *127-129, 132-163*.
   Claim(s) withdrawn from consideration: _____.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
12. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
13. ☒ Other: Please see attached PTO-892.

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1727

Continuation of 3. NOTE: The proposed amendment filed on 9/23/2010 raises the issue of new matter and new issues that would require further consideration.

It appears that the proposed amendments to claims 128, 129, and 132 by adding the limitation "purified" before "cage molecules" would not overcome the rejections of record for these claims because the transition phrase "comprising" in these claims is open-ended and the claims are therefore not limited to purified cage molecules consisting of carbon atoms; consequently, these proposed amendments to claims 128, 129, and 132 would require further consideration.

With respect to proposed new claim 164, the limitation that the cage moiety is soluble in non-polar organic solvents is new matter. The examiner never proposed this claim language. The examiner agreed to the claim language drawn to "cage molecules consisting of carbon atoms, which are soluble in non-polar organic solvents," and did not propose the limitation to "cage moiety is soluble in non-polar organic solvents." This proposed limitation in new claim 164 is not supported by the original disclosure and is a new issue that requires further consideration.

With respect to new claim 165, the proposed limitation "said cage moiety is a polyhedral carbon cage" is a new issue that requires further consideration and was not suggested by the examiner. Furthermore, this proposed limitation appears to be new matter; the original disclosure does not provide written description support for a "cage moiety" that is a "polyhedral" carbon cage.

With respect to new claim 166, the limitation "wherein said cage moiety is C60" is new matter. The original disclosure does not provide written description support for a product comprising a "cage moiety consisting of carbon atoms" where the cage moiety is C60. Proposed new claim 166 is drawn to the genus to a C60 cage moiety, which encompasses innumerable and diverse derivatives of C60 that are not disclosed in the instant application. The instant application gives only two prophetic examples of a molecule having a cage portion consisting of carbon atoms on page 15 of the specification, namely C60H60 and C60F60, which are not representative of the genus to a cage moiety consisting of carbon atoms where the cage moiety is C60. Proposed claim 166 encompasses the polysubsubstituted C60 molecules discussed in Chiang et al. (US Patent 5,294,732) that was applied in a 102(b) rejection against instant claim 127. The polysubstituted C60 molecules disclosed in Chiang et al. have very different properties as compared to those of C60H60 and C60F60.

In contrast, the C60 and C70 MOLECULES are representative of the genus to cage MOLECULES CONSISTING OF carbon atoms whose members (C240 being a higher order family member) have similar chemical and physical properties. As stated in MPEP 2163.05, "[t]he written description requirement for a claimed genus may be satisfied through sufficient description of a representative number of species. A 'representative number of species' means that the species which are adequately described are representative of the entire genus. Thus, where there is substantial variation within the genus, one must describe a sufficient variety of species to reflect the variation within the genus." Applicants have not adequately described in the original disclosure a sufficient variety of species to provide written description support for the genus to "cage moiety" wherein the "cage moiety is C60."

It is important to point out that a C60 molecule is not considered a cage moiety because a C60 molecule by itself is not part of another molecule. Also, a C60 molecule is not a polyhedron because it is spherical in shape. A polyhedron contains flat surfaces. See for example, A. Perez-Garrido, "Numerical study of shapes of fullerenes with symmetrically arranged defects," J. Phys.: Condens. Matter 14 (2002), pp. 5077-5082.

These new issues and new matter in the proposed new claims and claim amendments filed on 9/23/2010 therefore do not place the application in better form for appeal because they do not reduce or simplfy the issues for appeal.

Continuation of 5. Applicant's reply has overcome the following rejection(s): On pages 15-16 of the remarks filed on 9/23/2010, applicants acknowledge that Examiner Chaney pointed out the following in the September 12, 2008 non-final Office action at page 3 (applicants incorrectly stated that the following statements appear on page 4 of the September 12, 2008 non-final action):

"Applicant uses several terms in the claims that appear to be equivalent at the time of filing of the instant application. At the time of filing, the term 'fullerene' was understood to mean the family of hollow caged carbon molecules with an even number of carbon atoms represented by C60, C70, etc. as stated by Harold Kroto in his declaration filed on 16 November 1999 in the instant application. At the time of filing, the terms 'a cage carbon allotrope consisting solely of carbon atoms soluble in non-polar organic solvents', 'a cage carbon allotrope consisting solely of carbon atoms soluble in non-polar organic solvents, which allotrope of carbon is neither graphite nor diamond', 'allotrope of carbon consisting solely of carbon atoms, and soluble in non-polar solvents, which allotrope of carbon is neither graphite nor diamond', and 'a cage carbon allotrope consisting solely of carbon atoms' can only refer to the carbon allotrope represented by the fullerene family since the only other known carbon allotropes at the time of filing are diamond and graphite."

On page 16 of the remarks filed on 9/23/2010, applicants apparently agree that the limitation to "cage molecules consisting of carbon atoms" is also equivalent to the terms mentioned above for "fullerene" at the time of the effective filing date of the instant application, which is September 10, 1990.

The statements above regarding the equivalency of the limitation "cage molecules consisting of carbon atoms" and the term "fullerene" as was understood by one of ordinary skill in the art at the time of the effective filing date of the instant application, which is September 10, 1990, are persuasive.

After further consideration by the examiner, the rejections of claims 122-126, 130, and 131 under 35 USC 112, first paragraph as set forth in the June 23, 2010 final Office action are withdrawn. Claims 122-124, 126, 130, and 131 are allowed for the reasons given below. Claim 125 is objected under 37 CFR 1.75 as being a substantial duplicate of claim 124. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

At the time of the effective filing date of the instant application, which is September, 10, 1990, the term "fullerene" was understood by one of ordinary skill in the art to mean the family of cage molecules consisting of carbon atoms, the molecules being largely spherical and represented by the C60 and C70 molecules. This meaning of the term "fullerene" is evidenced by Dr. Harold Kroto's declaration filed on 2/22/2005 in the instant application and executed on 11/16/1999. For example, Dr. Kroto made the following statements in his declaration executed on 11/16/1999 at paragraphs 2, 10, 17, and 29, respectively:

"I have written several articles on the subject, as evidenced by the publications listed in Exhibit 1, including the first definitive and only complete review on the subject in Kroto et al., in Chemical Review 1991, 91, 1213-1235. I therefore believe that it is fair to say that I am among the recognized experts on the subject of fullerenes.

....

'Fullerenes', in my opinion, is a term of art that is also widely understood by the scientific community; it was adopted to conveniently describe the family of caged carbon molecules represented by C60. See, e.g., the section entitled 'Fullerene' in the Concise Encyclopedia of Science and Technology, 3rd ed., Sybil P. Parker, ed., McGraw Hill, NY, NY, p. 819 (994), attached hereto as Exhibit 2. This section, which was written by me, describes fullerenes as an even number of carbon atoms arranged in a closed hollow cage, and specifically exemplifies fullerene-60, or C60, as a species of fullerenes. However, there are other species of fullerenes, and many of those can and have been prepared by the process described in the above-identified specification.

....

Utilizing the procedure exactly as described in the above-identified application, I have had fullerenes, including C60, prepared in macroscopic amounts on numerous occasions since 1990 to the present. More specifically, by following the procedure described in the above-identified application and vaporizing graphite rods in an atmosphere of helium, forming the carbon soot therefrom, collecting the soot and dissolving the soot in benzene, in accordance with the procedure described in the above-identified application, I and my colleagues have prepared and identified various fullerenes, including, inter alia, C60, C70, C76, C78, C84, and C86."

....

In my opinion, the term 'caged [sic] carbon molecules consisting solely of carbon atoms which are soluble in non-polar organic solvents' uniquely describes fullerenes..."

As stated above, applicant confirmed the meaning of the term "fullerene" and the limitation "cage molecules consisting of carbon atoms" at the time of the effective filing date of the application on pages 15-16 of the remarks filed on 9/23/2010 in the instant application. To reiterate, Examiner Chaney in the Office action dated September 12, 2008 acknowledged (1) the meaning of the term "fullerene" as was understood by one of ordinary skill in the art at the effective filing date of the application, which is September 10, 1990, and (2) applicants' admission that the term "fullerene" and the limitation to "cage molecules consisting of carbon atoms," which are inherently soluble in non-polar organic solvent, are equivalent. As discussed in Kroto's 1991 journal article (Kroto et al., "C60: Buckminsterfullerene," Chem. Rev. 91 (1991), pp. 1213-1235), which was submitted as an attachment to his declaration dated 27 August 2007 and filed on September 7, 2007 in the instant application, "fullerene" was understood by one of ordinary skill in the art to be the family of cage molecules consisting of carbon atoms that are spherical in shape (also called spherical fullerenes today as evidenced by the literature articles discussed below). The C60 and C70 molecules produced and isolated by applicants are inherently soluble in nonpolar organic solvents, which is a common characteristic shared by the spherical fullerenes - namely, the cage carbon molecules consisting of carbon atoms. Other examples of spherical fullerenes that can be produced and extracted using applicant's disclosed method in the instant application are evidenced by the declaration of Dr. Adam Darwish filed on September 7, 2007 in the instant application. Dr. Darwish provided evidence that he was able to prepare and isolate C60, C70, C76, C84, C86, and C90 using the disclosed method in the instant application.

In 1991, carbon nanotubes were discovered and are regarded by one of ordinary skill in the art either as another subgenus of fullerene (called tubular fullerenes today) or as an entirely different class of molecules having different properties from those of the spherical fullerenes (i.e., cage molecules consisting of carbon atoms).

The following literature articles cited below confirm that cage molecules consisting of carbon atoms is regarded today by one of ordinary skill in the art as either (1) a subgenus of fullerene that is distinct from the carbon nanotube subgenus of fullerene or (2) a fullerene that is different from carbon nanotubes, with carbon nanotubes being regarded as a distinct class of molecules consisting of carbon atoms having different properties and a cylindrical or tubular shape.

The following literature articles fall under category (1) which regard cage molecules consisting of carbon atoms as a subgenus of fullerene that is distinct from the carbon nanotube subgenus of fullerene:

(1) Hu et al., "Bond order bond polarizability model for fullerene cages and nanotubes," J. Chem. Phys., vol. 123, issue 21 (2005), 214708.

(2) "Fullerene." Encyclopaedia Britannica's Guide to the Nobel Prizes. [online], 2010. [retrieved on 2010-09-27]. Retrieved from the Internet: <URL: http://www.britannica.com/nobelprize/article-9002185>.

(3) Karthikeyan et al., "Large Scale Synthesis of Carbon Nanotubes," E-Journal of Chemistry, 6(1), pp. 1-12 (2009) [online]. [retrieved on 2010-09-27]. Retrieved from the Internet: <URL: http://www.e-journals.net>.

It is important to note that the Karthikeyan et al. journal article points out on page 3 that "[w]hen pure graphite rods are used, the anode evaporates to form fullerenes, which are deposited in the form of soot in the chamber. However, a small part of the evaporated anode is deposited on the cathode, which includes CNTs," the CNTs being the abbreviation for carbon nanotubes. This means that the method disclosed in the instant application does not isolate carbon nanotubes from the sooty carbon product as the nanotubes are deposited on the cathode and are not in the sooty carbon product.

The following literature articles fall under category (2) which regard cage molecules consisting of carbon atoms as a fullerene and carbon nanotubes as a distinct class of carbon material that is different from fullerene:

(1) D.M. Ugarte, "Novel Graphitic Structures: Fullerenes, Nanotubes, and Onions," [online], 1994. [retrieved on 2010-09-27]. Retrieved from the Internet: <URL: http://www.fondationlatsis.org/plpdf/Prix_Latsis/EPFL_1994.pdf>.

(2) M.S. Dresselhaus, "Carbon-Based Nanostructures," [online]1998, WTEC Hyper-Librarian [retrieved on 2010-09-27]. Retrieved from the Internet: <URL: http://www.wtec.org/loyola/nano/us_r_n_d/09_02.htm>.

(3) Wu et al., "Computationally designed families of flat, tubular, and cage molecules assembled with "starbenzene" building blocks through hydrogen-bridge bonds," Chemistry, vol. 16, no. 4 (2010), pp. 1271-80.

(4) J.Y. Kang, "A Review of the Emerging Nanotechnology Industry: Materials, Fabrications, and Applications," Department of Toxic Substances Control, [online] September 2010. [retrieved on 2010-09-27]. Retrieved from the Internet: <URL:http://www.dtsc.ca.gov/TechnologyDevelopment/Nanotechnology/upload/Review_of_Emerging_Nanotech_Industry.pdf >.

Thus, the claim limitation to "cage molecules consisting of carbon atoms" did not encompass carbon nanotubes at the effective filing date of the instant application, which is September 10, 1990 [see 1987 journal article by Dr. Harold Kroto ("The stability of the fullerenes Cn, with n=24, 28, 32, 36, 50, 60, and 70," Nature, vol. 329, pp. 529-531, 1987) that refers to cage molecules consisting of carbon atoms as "fullerenes"]. Furthermore, the claim limitation to "cage molecules consisting of carbon atoms" presently does not encompass carbon nanotubes as evidenced by the literature articles cited above illustrating the state of the art. It is clear from the cited scientific literature that one of ordinary skill in the art would not consider carbon nanotubes to be encompassed by cage molecules consisting of carbon atoms; carbon nanotubes are regarded as tubes or cylinders and not cages.

With respect to claims 124, 125, 130, and 131, the closest prior art of record (Fang et al., Osawa et al., Kappler et al., and Lefevre et al.) do not disclose, teach, or suggest crystalline C60 or C70, which would read on crystalline cage molecules consisting of carbon atoms or cage molecules consisting of carbon atoms in crystalline form.

With respect to claims 122, 123, and 126, the closest prior art of record (Fang et al., Osawa et al., Kappler et al., and Lefevre et al.) do not disclose, teach, or suggest purified C60 or purified C70, which would read on purified cage molecules consisting of carbon atoms. Kappler et al. (J. Appl. Phys. 50 (1), 1979, pp.308-316) and Lefevre ("Investigation of Iron and Carbon Dusts," Annales D' Astrophysique, vol. 30, no. 4, pp. 731-738, 1967), both disclose the method of producing cage molecules consisting of carbon atoms (with C60 and C70 disclosed in the references reading on this genus to cage molecules consisting of carbon atoms) but do not disclose, teach, or suggest isolating C60 or C70 to any degree from the sooty carbon product. The C60 or C70 found in the coal samples of Fang et al. and Osawa et al. are not found isolated, extracted, separated, or purified in nature.

Claims 127-129, and 132-163 remain rejected for the reasons (except for the statements regarding carbon nanotubes, which are not applicable) set forth in the June 23, 2010 final Office action.